

Reforestation Programs

Public Involvement/Participation

Description

Reforestation is essential to the restoration of many natural habitats. These forested buffers between land and water are an essential part of the ecosystem. In some parts of the country, however, they are disappearing at an alarming rate. Reforestation programs attempt to preserve and restore forested buffers and natural forests. In areas all over the country, volunteers, community groups, and state and local conservation groups have initiated tree planting efforts.

In addition to buffer establishment and improvement with reforestation, municipalities can accomplish several tasks including park improvement, neighborhood and highway beautification, and provision of shade in parking and pedestrian areas. A municipality should determine what their priorities are and identify candidate sites for reforestation based on these priorities.



With the variety of tasks involved in tree planting efforts, everyone can help out. While some people man wheelbarrows, haul the plants, or shovel ground, there are many less-strenuous ways that volunteers can assist in these efforts. For example, to maintain a steady supply of trees, some organizations establish small nurseries where volunteers can pot seedlings and care for them for about 2 years until they are ready to be transplanted to a natural setting. Other participants in a tree planting program might be responsible for contacting local businesses, residences, or nursery farms to seek financial or vegetative donations.

Applicability

Reforestation programs can be used throughout a community to reestablish forested cover on a cleared site, establish a forested buffer along stream corridors to filter pollutants and reduce flood hazards, provide shade and aesthetic benefits in neighborhoods and parks, and improve appearance and pedestrian comfort along roadsides and in parking lots. It is up to the municipality to choose candidate sites for reforestation programs, and these decisions can be based on residents' recommendations or on overall capital improvement goals of the community.

Implementation

Municipalities should determine who will be in charge of a reforestation program. The program can be run by the local environmental department if one exists, but this department needs to have the organizational and managerial capacity to handle such an undertaking. Additional staff may need to be hired to conduct this program. Another option is to solicit volunteer organizations to run the program. The municipality can provide support to these volunteer groups in the form of materials, equipment, staff supervision, and funds for additional expenditures.

Funding for a reforestation program can come from a variety of sources, both public and private. Federal grants are available through USDA (Wildlife Habitat Incentives Program, Forestry Incentives Program, Resource Conservation and Development Program, Small Watershed Program, Watershed Surveys and Planning) and EPA 319(h) funding for nonpoint source demonstration projects, among others). More information about these and other federal grant programs can be found at USDA's Natural Resources Conservation Service web site at www.nrcs.usda.gov/NRCSProg.html and EPA's Nonpoint Source Control Branch web site at www.epa.gov/owow/nps/funding.html. State funds also might be available for reforestation programs--municipalities should check with state environmental agencies to identify what grant and loan programs are available for this purpose.

Additionally, municipalities can look to private sources of funding. Partnerships can be established with nurseries or with the organizations participating in the volunteer effort. Also, municipalities can solicit contributions from developers and businesses that want to be associated with this endeavor. Finally, citizens can donate money to have trees, groves, or parks named after them.

Once the program and funding are established, the next step is to choose sites suitable for tree planting efforts. Areas of disturbance such as sparsely vegetated streambanks or areas on the periphery of a forest are often ideal for restoration efforts. When the site is selected, it is important to conduct a detailed feasibility study to ensure the success of the tree planting. Each site has unique soil and other environmental characteristics that must be considered when selecting tree species to be planted. To properly assess a site, it is wise to consult a local horticulturist or landscape architect for technical assistance. Park employees, rangers, local scientists, and experts at nurseries and garden stores can also provide advice concerning the types of native tree species that are appropriate under various conditions. Municipalities should develop a timetable for planting depending on program priorities, site conditions, and the availability of materials and labor.

Once the site and tree species are selected and a schedule is set, the municipality should organize an outreach campaign to get the word out about the reforestation program to the public. This outreach campaign can advertise the reforestation program at town meetings or by holding meetings with individuals and groups, such as neighborhood coalitions, that might be interested in participating in a reforestation program. Additionally, if municipalities have a web site or newsletter, the program and volunteer opportunities can be advertised there.

Once volunteers are found, the next step is to secure the materials and equipment needed for tree planting events. Trees for plantings can be donated, purchased commercially, or raised by the group, but note that raising them involves a significant time commitment (up to 2 years). A commitment is needed from the nursery that the plants will be delivered in a timely manner for the planting.

The site might need to be prepared for planting. This preparation includes clearing any vines or other overgrowth from the planting area. Equipment and supplies also must be collected prior to the planting. For example, shovels, wheel barrels, gardening gloves, pruning cutters, and mulch should be gathered and transported to the site. This equipment can be supplied by the public works department or a local contractor.

With the materials collected and in place, tree planting can begin. Trees and shrubs take about a year to become established in a new environment, during which time substantial root growth occurs. To ensure that trees flourish in their new environment, consult with a horticultural specialist or other expert for detailed planting instructions and specifications. The plant specialist should also recommend maintenance of the newly planted trees, and inspections should be made to identify and repair vandalism if it occurs. Maintenance can be conducted by the municipality or volunteer groups, but a plan and schedule must be in place to ensure that maintenance occurs as scheduled.

Effectiveness

With the proper tools, types of plants, planting, and maintenance, reforestation can be very effective in reducing pollutants in and decreasing the volume of storm water. The nonprofit organization American Forests conducted a study in the Houston area to document urban forest covering a 3.2-million-acre area. They also analyzed 25 specific sites with aerial photography using CITYgreen software to map and measure tree cover and to calculate the benefits of Houston's trees. Study results show that trees provide significant benefits relative to storm water runoff, energy savings, and pollutant removal. The study found that Houston's tree cover reduces the need for storm water management by 2.4 billion cubic feet per peak storm event, saving \$1.33 billion in one-time construction costs (ENN, 2001).

Benefits

Pollutants in urban and agricultural runoff, especially sediment that reduces the water clarity, nutrient pollution from fertilizers and manure, and toxics from weed and pest killers, can freely flow into valuable natural water resources without a vegetated buffer along stream corridors and lakeshores. Trees and forested areas reduce runoff through interception and by increasing surface storage and infiltration. The trees mitigate peak flows through storm water retention, provide habitat for wildlife, shade streams to help maintain appropriate water temperatures, and provide aesthetic benefits. Trees are also beneficial in urban areas. Not only are they aesthetically pleasing, but they also provide habitat for wildlife, capture rainfall, and reduce the urban heat index, which in turn reduces the need for air conditioning.

Limitations

Limitations to an effective reforestation program include the costs associated with buying and planting the trees and other vegetation, finding people to install and maintain the plants, and continuing the upkeep of the buffer areas. Weather patterns, such as hurricanes and other storms or droughts, can cause significant damage to reforested areas. These natural weather patterns are unavoidable, but if indigenous vegetation is used, the plants are more likely to survive.

Cost

Reforestation programs involve a variety of costs, especially staff time needed to organize the program, select sites, coordinate supplies, and recruit, organize, and supervise volunteers. Supplies and equipment might also be expensive, depending on the size of the reforestation effort. The cost to the municipality can be minimized by soliciting donations from businesses and private citizens and by obtaining grants and loans from public sources.

References

Chesapeake Bay Foundation. 2000. *Environmental Education: Restoration Projects*. [<http://www.cbf.org/education/restoration.htm>]. Accessed January 2001.

Environmental News Network (ENN). 2001, January 10. *Calculating the Benefits of Houston's Urban Trees*. [<http://www.enn.com/extras/prINTER-friendly.asp?storyid=3085&pr=1>]. Accessed April 6, 2001.

Temple University. 1999. *The Volunteer*. Vol. 2(1), Winter 1999. Temple University. [<http://www.members.tripod.com/Wissrestoration/index.html>].

Trees for Houston. 1999. *Reforestation Program*. Trees for Houston, Houston, TX. [<http://www.neosoft.com/~trees/reforestation.html>].

Trees for Houston. 1999. *Trees for Houston's Neighborhood/Parkway Program*. Trees for Houston, Houston, TX. [<http://www.neosoft.com/~trees/parkways.html>].

Wetland Plantings

Public Involvement/Participation

Description

Wetlands are unique ecosystems that are home to a great diversity of terrestrial and aquatic plants and animals and are beneficial in many ways. They have the ability to improve water quality by filtering and accumulating pollutants, thereby protecting adjacent rivers, lakes, and streams. Wetlands also provide food, protection from predators, and other habitat factors for many of the nation's fish and wildlife species, including endangered and threatened species. Finally, wetlands have economic value associated with recreational, commercial, and subsistence use of fish and wildlife resources.



Over time, many wetland, riparian, and lakeshore environments have become degraded by human-induced disturbances, such as the introduction of invasive, non-native plants. Such exotic vegetation can reduce habitat quality (e.g., loss of food supply), contribute to an unkempt, weedy appearance, and obscure the waterbody from view. These disturbances have not only affected the natural functions of these systems by causing increased erosion, a decline in natural wetland vegetation, and degraded habitats, but they have also reduced the aesthetic value of the environment. Wetlands and waterbodies are also disturbed by land development activities in adjacent areas and in upland areas within the watershed. These disturbances often result in sediment deposition, nutrient enrichment, and increased storm water flows into the wetlands. This causes a reduction in water clarity that ultimately limits the growth of wetland plant species and submerged aquatic vegetation, the smothering of streambeds, contamination of water quality, and alteration of natural hydrology.

Applicability

Municipalities can plant wetland species to both preserve existing wetlands and enhance degraded wetland plant communities. Wetland plantings however, are only one part of what a municipality might undertake when restoring, protecting, or creating a wetland.

When preserving and enhancing degraded wetlands, it is often necessary to plant wetland species along shorelines, in upland habitats, and along the bottom of waterbodies. Each wetland can be divided into specific zones based on soil hydrology. Upland transitional zones are adjacent to normally wet or inundated wetland areas. These zones are extremely important to the health, function, and appearance of the wetland or waterbody. Wetland and open water zones range from having saturated soil below the ground surface (such as in a wet meadow) to being completely inundated with water (such as a shoreline or streambank). These areas can support wetland plant species ranging from sedges and shrubs that are intolerant of inundation to emergent species and submerged or floating plants.

Municipalities can also use wetlands mitigation banking when preserving degraded wetland communities. A wetland mitigation bank is a wetland area that has been restored, created, enhanced, or preserved, and is then set aside to compensate for future wetland conversion from development activities. A municipality can participate in wetland mitigation by undertaking such preservation activities under a formal agreement with a regulatory agency. In Pembroke Pines, Florida, 358 acres of degraded wetlands on city property were restored through the Florida Wetlandsbank. For more information on mitigation and conservation banking, including contact information for local bankers and regulators, contact the Terrene Institute at www.terrene.org.

Implementation

When beginning a wetland planting, it is important to keep in mind that any entity that alters a wetland must first get a permit from the U.S. Army Corps of Engineers. This requirement is specified under the Clean Water Act, Section 404.

The first step in a wetland planting program is to determine the history of the site, including previous vegetation and typical conditions. Another important factor is the hydrology of a site. Hydrology defines such factors as average and maximum depth, duration of inundation, and degree of soil saturation. Hydrology establishes the soil and plant conditions that distinguish between different wetland types and streambank and shoreline environments. Municipalities should work with a reputable wetland firm to determine these conditions. Other factors that should be considered for wetland plantings are described below.

Plant species selection. Selection of plants for wetland, streambank, and shore zones is closely tied to the hydrology of the site, particularly water depths and flood durations. Other factors such as shading, water clarity, and salinity should be taken into account as well. Planting in open water areas typically involves the use of tubers, plugs, and potted plants. Planting in nonponded wetland zones often involves both seeds and live plants. Project planners must be familiar with different types of plants that can be used, depending on the site's characteristics. Field tests can be useful to delineate planting zones on a site that contains a range of hydrologic regimes.

It is important to use a diverse mix of wetland plants and not just one type of plant such as *Phragmites* (reed grass) or cattails. These and other aggressive species are very easy to establish but should not be planted. They will outcompete other valuable species and will eventually dominate less robust colonizers.

As wetlands also exist along streams, it is important to establish riparian vegetation in these areas. Riparian vegetation stabilizes banks, provides large woody debris and detritus for aquatic habitat and food, and shades the stream, reducing water temperatures. Reestablishing riparian cover along streams can call for active reforestation of native species, removal of exotic species, or modification of mowing options to allow gradual succession.

The types of vegetation planted should depend upon geographic location, climate, and soil conditions. Species that are native to the area are naturally better suited to its conditions. Riparian vegetation includes grasses, shrubs, and trees. While all of these types of vegetation help stabilize stream banks and filter storm water, their effectiveness varies. For example, deeply rooted plants might work better than certain grasses for transforming nitrogen because the roots can reach deeper flowing water.

Information on native plant species selection, how and when to plant, and other local factors is available from federal agencies, such as the Natural Resources Conservation Service, and from various state and local agencies. A local Cooperative Extension Service is another good source of information.

Initial and long-term management and maintenance. Many wetlands become overgrown with non-native, invasive plant species following a disturbance. Noxious weeds can be controlled in a variety of ways. Controlled burning is a commonly used technique for wetlands, natural streambanks, and shorelines. Timing is important, since these areas burn well only at very specific times of the year. Furthermore, fires in wetland areas can be very intense, especially where cattails and giant reed grasses are present; therefore, special care should be exercised. A 2- to 3-year rotation for prescribed burnings is appropriate.

Invasive species can also be removed by physically extracting them from the site. This process is often difficult because many non-native species grow in dense patches with extensive root systems.

For species that are particularly difficult to eliminate using prescribed burning or physical extraction approaches, chemical control of non-native species is sometimes warranted. Herbicide techniques are different from those used in upland sites, primarily because herbicides have to be licensed for use in or near waterbodies, wetlands, and other aquatic systems. Chemical means of weed reduction should be used only when necessary, and product labels should be read and closely followed. Only a licensed herbicide applicator should conduct this work.

Effectiveness

If hydrologic and soil conditions are conducive to plant growth, wetland plantings often respond very quickly. Extensive cover of native plants often can be achieved during the first growing season. Noxious weed control through the use of mowing or pruning is often necessary during the first several years. Some replanting might also be necessary. A stable, diverse, and aesthetic wetland/riparian landscape might take 3 to 5 years to achieve.

It is important to understand that the success of wetland plants will not be immediate and that the effort does not end with the planting itself. Wetland plants should be routinely monitored following planting. If the plantings do not appear to establish themselves, it is important to reevaluate the site selection and conditions before replanting. With each revegetation effort, new information about suitable habitat and conditions will be gained from both successful and unsuccessful planting attempts.

Benefits

Planting programs can be beneficial to wetlands in several ways. First, these plantings act as a "jump-start" for areas that are bare or significantly disturbed. Although revegetation might not completely cover a disturbed area, it is a means of establishing plant species that can then propagate. By planting indigenous aquatic species, the natural functions of wetlands can be restored, including storm water filtration, nutrient uptake, sediment removal, and peak flow attenuation. Another value of revegetation programs is educating the public about wetland plants and their value. By working on wetland planting projects, the public has a hands-on opportunity to improve wetlands and aquatic environments. Also, wetland planting projects help scientists learn more about which environments and growing conditions promote plant growth. Finally, reestablishment of wetland vegetation improves wildlife habitat for migrating waterfowl, reptiles, amphibians, and other aquatic species. For example, West Eugene, Oregon's, Stream Team and Parks Volunteer programs have resulted in the adoption of wetlands, stream segments, and parks by a number of agencies and organizations in the area (City of West Eugene, Oregon, 2001).

Limitations

The ability of the new plants to succeed depends on several factors, including the weather (drought or flood) and insect damage. Also, upstream or nearby development and land use changes may alter wetland conditions and result in altered salinity, hydrology, or other factors that can lead to die-off of recently planted vegetation. Maintenance is important to ensure that the plantings have successfully established themselves. Other problems associated with wetlands include the filling in of detention ponds that were originally built by developers. When this filling occurs, municipalities should determine whether or not they should convert the ponds into wetlands or return them to their original state.

Cost

Wetland planting programs are often sponsored by local or regional environmental agencies. Many organizations acquire financial support for replanting activities through fund-raising efforts and membership dues. Scientists and wetland experts are often willing to donate their time to conduct site visits and provide recommendations for the plant species selection process.

References

Briggs, M.K. 1996. *Our National Wetland Heritage: A Protection Guide*. University of Arizona Press, Tucson, AZ.

Briggs, M.K. 1996. *Riparian Ecosystem Recovery in Arid Lands: Strategies and References*. University of Arizona, Tucson, AZ.

Chesapeake Bay Foundation. 1999. *Planting Wild Celery*.
[http://www.cbf.org/notebook/cn_1999_05_25.htm].

City of West Eugene, Oregon. 2001. *Wetland Plantings*.
[<http://www.ci.eugene.or.us/wewetlands/get.htm>]. Accessed April, 2001.

The Federal Interagency Stream Restoration Working Group. 1998. *Stream Corridor Restoration: Principles, Processes, and Practices*. [http://www.usda.gov/stream_restoration]. Accessed July 27, 2000.

The Izaak Walton League. 2000. *American Wetlands Campaign*.
[<http://www.iwla.org/SOS/awm/index.htm>]. Accessed April, 2001.

Kentula, B., G. Holland, and S. Sifneos. 1993. *An Approach to Decision Making in Wetland Restoration and Creation*. CRC Press, Boca Raton, FL.

Terrene Institute. 2001. *Terrene Institute* [<http://www.terrene.org>]. Accessed April, 2001.

USEPA. 1998. The "How To" of Natural Landscaping. Chapter 4 in *A Source Book on Natural Landscaping for Public Officials*. U.S. Environmental Protection Agency, Washington, DC.
[<http://www.epa.gov/grtlakes/greenacres/toolkit/chap4.html>].

USEPA. 1996. *Protecting Natural Wetlands: A Guide to Stormwater Best Management Practices*. EPA 843-B-96-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

USEPA, 1995. *Ecological Restoration: A Tool to Manage Stream Quality*. EPA 841-F-95-007 U.S. Environmental Protection Agency, Office of Water, Washington, DC.

USPS. 1999. *Chesapeake Bay Watershed Grounds Management Plan*. United States Postal Service, Washington, DC.

World Wildlife Fund. 1992. *Statewide Wetlands Strategies: A Guide to Protecting and Managing the Resource*. Island Press. Washington, DC.

Adopt-A-Stream Programs

Public Involvement/Participation

Description

Adopt-A-Stream programs are an excellent public outreach tool for municipalities to involve citizens of all ages and abilities. They are volunteer programs in which participants "adopt" a stream, creek, or river to study, clean up, monitor, protect, and restore. Through these activities, the adopting group or organization becomes the primary caretaker of that stretch of stream in the watershed.



Adopt-A-Stream volunteers help monitor their stream (Source: Kodak, 2001)

Applicability

A municipality can tailor an Adopt-A-Stream program to allow participation from any group or organization within a watershed. Adoptions are as flexible and unique as the streams themselves. Adopting a stream is a great program for youth groups, including church groups, scouts, and school clubs, but it can also be a great activity for adult groups such as neighborhood associations, civic organizations, or businesses. Levels of involvement range from quarterly visual surveys and litter pick-ups to monthly testing to one-time habitat improvement projects. The objectives of the program are not only to remove litter, but also to improve the quality of the stream. Waste collected from stream banks and channels could spur local interest in maintaining and improving the water quality and aesthetics of all local waterbodies.

Municipalities can sponsor many different activities through Adopt-A-Stream programs, such as:

- Implementing stream cleanups
- Conducting streambank surveys
- Monitoring stream insects and gauging water quality
- Executing streambank enhancement projects, such as tree planting, to help control erosion and stabilize streambanks
- Implementing storm drain stenciling
- Conducting construction site surveys for proper storm water controls
- Promoting education about the watershed through stream walks, workshops, and other activities

Implementation

Municipalities can begin an Adopt-A-Stream program by obtaining a watershed map and marking potential stream sites on it. Rough watershed maps can be obtained from EPA's *Surf Your Watershed* web site (USEPA, 2000) at <http://www.epa.gov/surf>, or more detailed maps can be ordered from the U.S. Geological Survey (2001) at <http://mapping.usgs.gov>. The watershed map can then be used to keep track of which stretches are adopted and by whom. Once the stream sites have been identified, a monitoring and reporting plan to evaluate the conditions on the stream should be developed.

The next step is to prepare "how to" packets on each activity that can be distributed to interested organizations. Typical packets include

- Instructions and information needed to conduct an activity such as stream monitoring or storm drain stenciling
- Topographic maps of the area (with the stream of interest designated)
- Data sheets for recording observations
- Equipment or lists of necessary equipment (such as bags, gloves, and monitoring devices)
- First-aid kits
- Comments on the stream's history
- Field guides
- Contact information
- A basic "do's and don'ts" list for what to do if hazardous materials like syringes are encountered
- Safety tips
- General hints for a successful cleanup
- Rewards for volunteers (such as stickers or certificates)

For example, a packet for conducting a stream cleanup might include trash bags and gloves, a map designating appropriate trash pickup sites along the stream and private land areas for which special permission might be required, and a list of contact information for trash collectors and recyclers.

Most Adopt-A-Stream programs also require documentation to be completed by their participants. For example, almost all programs call for a registration form to be completed by the group. Items that can be included on the registration form include the group's name, a contact person's name and address, the stream's name and location, a description of the stream stretch with landmarks (e.g., "from High Bridge north to Route 58 overpass"), the length of the stream, and the anticipated number of participants.

Some programs also require forms to be completed for a specific event such as a stream cleanup. A cleanup report should provide a record of the length of the area cleaned, the number of participants, and the amount of litter collected (e.g., the number of bags, total weight, and counts of trash items by category). To save on mailings, a master copy of the cleanup report can be mailed to the participating organization, which can reproduce the report for its members before each cleanup. If the organization keeps the original form and topographic map, trends in litter volume or other stream parameters over time can be noted.

Publicizing the Program and Its Activities. The media should be used whenever possible to spread the word about the Adopt-A-Stream program and the activities it sponsors. Advertisements can be placed in newspapers, public service announcements (PSAs) can be broadcast on TV and radio, and an Internet site can be developed with program information. Community groups and schools should be targeted in the outreach campaign through presentations and assemblies, stressing that the program is educational, philanthropic, and fun.

To help advertise Adopt-A-Stream events, news releases can be sent to local newspapers and radio and television stations before an activity occurs. Contacting the media in advance of a cleanup, storm drain stenciling event, or educational stream walk allows the press to cover the activity as it happens. When the activity is completed, a second news release explaining what was accomplished can be sent to the media.

Partnering with Schools. Many Adopt-A-Stream programs partner with schools to develop interdisciplinary classroom curricula and activities. Through the program, teachers and students adopt a waterway and perform chemical, physical, and biological testing to determine water quality and perform habitat restoration. Participating in such an interdisciplinary program gives classroom learning a real-life application, enhances students' problem-solving capabilities, and provides community recognition of the students' efforts. Teachers can select projects and activities that best match their students' capabilities and the materials and resources available. The national Adopt-A-Stream organization www.adopt-a-stream.org, as well as numerous agencies nationwide, can provide teacher's guides for developing a classroom Adopt-A-Stream program.

Some schools find it valuable to enlist a cosponsor such as a community group or private organization to aid them in their efforts. Cosponsors vary in their involvement with the students. Some activities that cosponsors can undertake include meeting with students to demonstrate community support for their efforts, helping to select an appropriate waterway, providing special information about the waterway, accompanying students on field trips, helping to prepare news releases and articles about the program, providing funds (if necessary), and helping to prepare a written report that compiles all of the data from schools in the watershed. Students and community members can then use this report as a focal point around which to plan strategies for involvement and actions for the coming year.

Effectiveness

The effectiveness of Adopt-A-Stream projects is exemplified by the Northwest Pennsylvania Chapter of Trout Unlimited's Adopt-A-Stream project located on Beaver Run in Erie County, Pennsylvania (NWPATU, no date). Beaver Run is a small meadow brown trout stream in southern Erie County, Pennsylvania. The Pennsylvania Fish and Boat Company designated Beaver Run as a class "A" wild trout water and stopped all stocking of hatchery trout. Over the years, some of the stream was subject to bank erosion caused by livestock grazing, resulting in siltation of pools and loss of habitat. Trout numbers had declined on the lower sections of the stream.

Some members of NWPATU had fished the stream over the years and knew that the stream was in decline. The chapter moved to adopt the lower mile and, with the blessing of the landowners, started project planning. The project would not have been successful without assistance from the Pennsylvania Fish and Boat Company, a cash grant from the National Trout Unlimited Organization, donations of equipment from chapter members, and the hard work of NWPATU and Gem City Fly Tiers members. The project's first phase was to build four wing deflectors, two mud sills, two bank cribbings, and two cattle crossings over a 2-year period. On August 17 and 18, 1996, and July 11 and 12, 1997, the chapter met for 4 days of hard work. The crew completed construction and installation all of the devices outlined in the plans. These restoration efforts would not have been completed without the efforts of the Adopt-A-Stream group.

Another example of a successful program can be found in West Eugene, Oregon. West Eugene has a Stream Team program that provides citizens of all ages an opportunity to learn about the city's water resources and their role in protecting them. West Eugene offers hands-on projects that allow citizens the opportunity to improve water quality (City of West Eugene, 2001). See <http://www.ci.eugene.or.us/wewetlands/default.htm> for more information on the city's efforts to restore their water resources.

Benefits

The benefits a municipality can achieve by implementing an Adopt-A-Stream program are numerous. Participants of the program help make areas in their watershed more visually attractive and improve habitat for wildlife, thus saving and restoring natural resources. In addition, the hands-on activities and recognition and exposure that schools, private organizations, and the community get when participating in an Adopt-A-Stream program provide a tremendous sense of accomplishment.

Limitations

Commitment is probably the greatest limitation a municipality can face when implementing an Adopt-A-Stream program. Many people sign up for activities but quickly find they do not have time for follow-up activities. This is one reason youth groups are so well suited for these projects. By integrating a stream program into a curriculum or into a yearly scout project, the group's commitment is ensured. Other limitations may include funding availability, weather, equipment maintenance, and liability associated with the dangers of slippery rocks or steep slopes.

Cost

The costs a municipality can incur when implementing an Adopt-A-Stream program would primarily result from the amount of time employees spend administering the program. Significant costs can also be associated with sponsoring an Adopt-A-Stream program. The costs incurred by sponsors depend on the level of assistance the sponsoring agency contributes to participants in the program, such as providing activity packets, technical expertise, and database management. On the other hand, the cost of participating in an Adopt-A-Stream program is very low. Equipment for monitoring can be borrowed from universities and other research facilities, and activities such as stream cleanups might require only bags, gloves, clipboards, and pencils, which can be provided at low cost. Media coverage of program events is free.

References

- Anne Arundel County. 1999. *Adopt A Stream*. [<http://www.saveourstreams.org/SOS-aastream.htm>].
- City of Rome. 1999. *Adopt-A-Stream*. Rome, Floyd County, GA. [<http://www.romegeorgia.com/adoptastream.html>].
- City of West Eugene. 2001. *The City of Eugene's Stream Team is Learning and Action*. [<http://www.ci.eugene.or.us/pw/stream/stream.htm>]. Last updated February 20, 2001. Accessed April 10, 2001.
- City of West Eugene. 2001. *West Eugene Wetlands Program*. [<http://www.ci.eugene.or.us/wewetlands/default.htm>]. Last updated January 25, 2001. Accessed April 10, 2001.
- Delta Laboratories. No date. *Adopt-A-Stream*. [<http://www.adopt-a-stream.org>]. Accessed April 10, 2001.
- Friends of the St. Joe River Association, Inc. No date. *Volunteer Opportunities!* [<http://www.fotsjr.org/helpus.htm>]. Accessed April 10, 2001.
- Kodak: Health, Safety, and Environment. 2001. *Adopt-A-Stream*. [<http://www.kodak.com/US/en/corp/environment/community/education/adopt.shtml>]. Accessed January 2001.
- NWPATU. No date. *NWPATU Beaver Run Adopt-A-Stream Project*. Trout Unlimited, Northwest Pennsylvania Chapter, Erie, PA. [<http://www.fisherie.com/nwpatu/project.html>].
- Saginaw Bay Watershed Council. No date. *Adopt-A-Stream Program* [brochure]. Saginaw Bay Watershed Council, University Center, MI.
- South Dakota Lakes and Streams Association. No date. *South Dakota Adopt-A-Stream Manual*. [<http://www.brookings.com/bswf/tp1.htm>]. Accessed April 10, 2001.
- U.S. Geological Survey (USGS). 2001. *National Mapping Information*. <http://mapping.usgs.gov>. Last updated May 15, 2001. Accessed June 14, 2001.
- U.S. Environmental Protection Agency (USEPA). 2000. *Surf Your Watershed*. <http://www.epa.gov/surf>. Last updated September 27, 2000. Accessed June 14, 2001.